

### **REMARKS/ARGUMENTS**

Applicants respectfully request reconsideration of the above-identified application.

Claim 3 has been objected to for the presence of a period at line 3. With the present amendment, that period has been deleted. The language following the period was inadvertently included in claim 3 and also has been deleted.

The present invention is addressed to an improved turning system for a multi-channel induction undulative accelerator. The improved turning system comprises a sequence of fragments of solenoids positioned about a generally U-shaped working channel to effect a 180° or smaller turning of the charged particle beam. Claim 1 also has been amended to particularly recite "said sequence of solenoid fragments being positioned about said working channel." Positioned in such a way, the solenoid fragments impart a gradual turning vector to the particles, creating a more efficient turning system.

Claims 1-4 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,433,494 issued to August 13, 2002 to Kulish, et al. (hereinafter, "Kulish, et al."). Kulish, et al.'s turning system is shown, for example, in Figs. 13-15 and described in the specification at Col. 8, lines 57-58; Col. 13, lines 56-67 and Col. 18, line 44 to Col. 20, line 43.

Looking to Figs. 13-15, it may be seen that the steering, or turning, system disclosed in Kulish, et al. utilizes a bi-polar magnet assembly. A single bi-polar magnet assembly is positioned at the end of each acceleration channel and effects the entire 180° turn to the particle beam. Solenoids, such as those shown at 288 and 290 in Fig. 14A, may be provided on the legs of the generally U-shaped bi-polar magnet to provide an operator adjustment of the magnetic turning field. Col. 19, lines 28-38. Such a turning system may be effective for relatively low energy particle beams; however, at higher energies (e.g., ~ 100Å or higher) the particle beam will experience large current losses as the particle beam is unable to pass through the bi-polar magnet turning system without scattering.

The present invention addresses this problem by proposing an improved turning system that incorporates a sequence of fragments of solenoid located about the working channel. For example, in Fig. 2 a series of solenoid fragments 9 are shown positioned about the working channel through which passes input beam 8. Positioned in this way, each of the fragments imparts a gradual turning of input beam 8. Using a sequence of fragments of solenoids suppresses excessive electron drift to the walls. Such drift is caused, for example, by the effect of Coulomb's repulsion forces between charged particles of the beam and excessive emittance of the beam from the acceleration channel. Suppression of electron drift along the total turn

provides retention of the controlled equilibrium configuration, which allows the particle beam to travel through a series of turning systems without substantial losses of the charged particles.

Kulish, et al. neither discloses nor suggests a sequence of fragments of solenoid positioned about the working channel. As such, claims 1 and 2 should be considered patentable over Kulish, et al.

Claim 3 further recites that "at least one of the fragments of solenoid is made in the form of a section of toroid." Although the Examiner cites Fig. 13-15 of Kulish, et al., a review of these figures shows that solenoids 288 and 290 are not toroidal. Nowhere does Kulish, et al. teach or disclose the use of a solenoid fragment in the form of a toroid.

The improved turning system may incorporate bi-polar magnets such as those disclosed in Kulish, et al. Such a configuration is illustrated in Figs. 3 and 4 with the bi-polar magnets 12 and 13 being interspersed between the solenoid fragments. Claim 4 recites a bi-polar magnet system placed in the space between the solenoids. As noted above, Kulish et al discloses a bi-polar magnet system but not a sequence of fragments of solenoid positioned about the working channel. Claim 4 should be considered patentable for this reason.

Claim 5, dependent on claims 1-4, also should be considered patentable for the reasons given above.

In view of the foregoing remarks, wherein the claim program is seen to readily distinguish over the references, Applicants earnestly solicit issuance of a Notice of Allowance.

Respectfully submitted,

Date: September 6, 2005

Diane E. Burke  
Diane E. Burke  
Reg. No. 45,725  
MUELLER AND SMITH, L.P.A.  
Mueller-Smith Building  
7700 Rivers Edge Drive  
Columbus, Ohio 43235-1355  
Tel.: 614-436-0600  
Fax: 614-436-0057  
email: [dburke@muellersmith.com](mailto:dburke@muellersmith.com)

Appln. No. 10/797,858  
Amendment dated September 6, 2005  
Reply to Office Action of June 3, 2005



CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited on September 6, 2005 with the United States Postal Service as first class mail in an envelope addressed to:

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

  
Gail James